

What is claimed is:

1 1. A restraining and protecting apparatus for a vehicle
2 occupant comprising:

3 a seat belt (3) to restrain a vehicle occupant on a seat;
4 a belt adjusting unit (12) to adjust a state in which said
5 vehicle occupant is restrained using said seat belt (3) by
6 increasing or decreasing said seat belt (3) to be drawn out in
7 length;

8 a belt locking mechanism (17) to prevent said seat belt (3)
9 from being drawn out by locking said seat belt (3);

10 an "immediately before collision" signal producing section
11 (11) to produce and output an "immediately before collision"
12 signal immediately before occurrence of a collision of said
13 vehicle;

14 a locking signal producing section (18) to produce and
15 output a locking signal when it is predicted at least that said
16 belt locking mechanism (17) is in a lockable state where
17 inhibition of drawing out is made possible when said seat belt
18 (3) is going to be drawn out;

19 a controlling section (24) to control said belt adjusting
20 unit (12) based on said "immediately before collision" signal
21 to be input and said locking signal to be input; and

22 wherein said controlling section (24) exerts control in a
23 manner that, when said "immediately before collision" signal is
24 input, said belt adjusting unit (12) increases said state in which
25 said vehicle occupant is restrained using said seat belt (3) and
26 that, when said locking signal is not input, said belt adjusting
27 unit (12) weakens said state in which said vehicle occupant is

28 restrained using said seat belt (3).

1 2. The restraining and protecting apparatus for a vehicle
2 occupant according to Claim 1, wherein said belt locking mechanism
3 (17) in said lockable state, when said belt adjusting unit (12)
4 is controlled by said controlling section (24) so as to increase
5 said state in which said vehicle occupant is restrained using said
6 seat belt (3), is put in a state of releasing locking in which
7 said seat belt (3) is able to be drawn out.

1 3. The restraining and protecting apparatus for a vehicle
2 occupant according to Claim 1 or Claim 2, wherein said controlling
3 section (24) exerts control so that, while said locking signal
4 is input, said belt adjusting unit (12) increases and maintains
5 said state in which said vehicle occupant is restrained using said
6 seat belt (3).

1 4. The restraining and protecting apparatus for a vehicle
2 occupant according to Claim 3, wherein said controlling section
3 (24) exerts control so that said belt adjusting unit (12), when
4 a predetermined time has elapsed after said locking signal has
5 been input, weakens said state in which said vehicle occupant is
6 restrained using said seat belt (3).

1 5. The restraining and protecting apparatus for a vehicle
2 occupant according to any one of Claim 1 to Claim 4, wherein said
3 controlling section (24) exerts control when said "immediately
4 before collision" signal is input so that said belt adjusting
5 unit (12) increases said state in which said vehicle occupant is

6 restrained using said seat belt (3) and that said belt adjusting
7 unit (12), said state in which said vehicle occupant is restrained
8 using said seat belt (3) is changed to a state in which said vehicle
9 occupant is restrained to a predetermined extent and when said
10 locking signal is not input, weakens said state in which said
11 vehicle occupant is restrained using said seat belt (3).

1 6. The restraining and protecting apparatus for a vehicle
2 occupant according to any one of Claim 1 to Claim 5, wherein said
3 locking signal producing section (18) outputs said locking signal
4 when at least part of conditions under which drawing of said seat
5 belt (3) is inhibited by said belt locking mechanism (17) is met.

1 7. The restraining and protecting apparatus for a vehicle
2 occupant according to Claim 6, wherein said seat belt (3) is locked
3 under condition that acceleration in a back-and-forth or lateral
4 direction of said vehicle exceeds a predetermined value.

1 8. The restraining and protecting apparatus for a vehicle
2 occupant according to Claim 6, wherein said seat belt (3) is locked
3 under condition that acceleration at which said seat belt (3) is
4 drawn out exceeds a predetermined value.

1 9. The restraining and protecting apparatus for a vehicle
2 occupant according to Claim 7 or Claim 8, wherein said
3 acceleration includes acceleration in a direction being reverse
4 to a direction of a velocity of said vehicle.

1 10. The restraining and protecting apparatus for a vehicle

2 occupant according to any one of Claim 1 to Claim 5, wherein said
3 locking signal producing section (18), when a state in which said
4 belt locking mechanism (17) is in a lockable state is detected,
5 outputs said locking signal.

1 11. The restraining and protecting apparatus for a vehicle
2 occupant according to any one of Claim 1 to Claim 10, wherein said
3 belt adjusting unit (12) has a motor to retract said seat belt
4 (3) and wherein said controlling section (13), where said
5 "immediately before collision" signal is input, controls said
6 motor to increase its driving power and to increase said state
7 in which said vehicle occupant is restrained using said seat belt
8 (3) and exerts control so that, said belt adjusting unit (12),
9 when said locking signal is not input, weakens said state in which
10 said vehicle occupant is restrained using said seat belt (3).

1 12. The restraining and protecting apparatus for a vehicle
2 occupant according to Claim 11, wherein said controlling section
3 (13), while said locking signal is input, controls said motor
4 serving as said belt adjusting unit (12) so as to have said seat
5 belt (3) retracted.

1 13. The restraining and protecting apparatus for a vehicle
2 occupant according to any one of Claim 1 to Claim 12, wherein said
3 "immediately before collision" signal producing section (11),
4 based on a detection signal obtained from a non-contact type
5 distance sensor, calculates a speed of said vehicle relative to
6 an obstruction existing in a front of said vehicle and, based on
7 a result from calculation, judges as to whether there is a

8 possibility of occurrence of collision between said vehicle and
9 said obstruction and also judges, when there is a possibility of
10 collision, as to whether said avoidance of collision is possible
11 or not.

1 14. The restraining and protecting apparatus for a vehicle
2 occupant according to any one of Claim 1 to Claim 13, wherein said
3 "immediately before collision" signal producing section (11),
4 when a detection of an operation for collision avoidance is made,
5 outputs said "immediately before collision" signal.

1 15. The restraining and protecting apparatus for a vehicle
2 occupant according to Claim 14, wherein said "immediately before
3 collision" signal producing section (11) outputs said
4 "immediately before collision" signal when detection of a rapid
5 brake operation or a rapid handle operation for collision
6 avoidance is made by being recognized that acceleration in a
7 back-and-forth or lateral direction of said vehicle exceeds a
8 predetermined value.